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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/577,233
Filing Date: April 26, 2006
Appellant(s): TUMA, JAN

Mark S. Bicks
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed January 25, 2011 appealing from the Office action mailed September 28, 2010.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

The following is a list of claims that are rejected and pending in the application:

Claims 10, 14, 16, 18, 20-22, 26, 28, 30, 32-34, 38, 40, 42, and 44-51.

(4) Status of Amendments After Final

Appellant has amended the claims after final in the response dated October 27, 2010. Examiner notes that these amendments have been entered as they were presented solely to overcome the 35 USC 112 1st and 2nd paragraph rejections stated in the final rejection dated September 28, 2010.

(**5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

WITHDRAWN REJECTIONS

The following grounds of rejection are not presented for review on appeal because they have been withdrawn by the examiner. 35 USC 1st paragraph rejection of claims 47, 49, and 51 and 35 USC 2nd paragraph rejection of claims 10, 14 16, 18, 20-22, 26, 28, 30, 32-34, 38, 40, 42, and 44-51 have been withdrawn from consideration on appeal due to Appellant's after final amendments and remarks filed on October 27, 2010.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

WO 03/099951 A2	Arzt et al.	12-2003
US 2006/0005362	Arzt et al.	1-2006
WO 2002/013647 A2	Tuma	02-2002
US 7,198,743	Tuma	4-2007
US 2003/020888	Fearing et al.	11-2003
US 2005/0072509	Full et al.	4-2005
US 7,018,496	George et al.	3-2006
US 2006/0047190	Jenkins et al.	3-2006
US 7,318,464	Hahn et al.	1-2008

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 10, 16, 18, 22, 28, 30, 34, 40, 42, and 44-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arzt et al. (WIPO Publication WO 03/099951 A2) in view of Tuma (Wipo Publication WO 2002/013647 A2).

4. ***Examiner is using Arzt et al. (US Pre-Grant Publication 2006/0005362) as the English Language Equivalent of WO 03/099951) and Tuma (USP No. 7,198,743) as the English Language equivalent of Tuma (Wipo WO 2002/013647)***.

5. Regarding claims 10, 22, and 34, Arzt teaches a process for producing adhesion elements on a substrate (object – part 10 of figure 1). **(See abstract and figure 1)**.

a. Arzt goes on to teach:

i. The use of polyvinyl siloxane as the material/object to be molded or shaped in order to form adhesion elements. It is well known and obvious to those having the ordinary skill in the art that polyvinyl siloxane is thixotropic.

(1) **See paragraph 0103 for Polyvinyl siloxane**

(2) **See paragraphs 0086-0087 and 0094-0095 disclosing shaping/molding o the polyvinyl siloxane**

ii. Wherein the packing density of adhesion elements (contact structures) is 10^6 to 10^7 per cm^2.

(3) **See paragraph 0069**

iii. The adhesion elements (projections) having a height from 20000 nm to 200 micrometers a diameter of 20 nanometers to 20 micrometers.

(4) **See paragraph 0068 to 0070**

(5) **See figure 6 show height (part a) and diameter (b)**

iv. The end is at least 20 micrometers.

(6) **See figure 6 show height (part a) and diameter (b)**

(7) **See also figures showing that flared ends can be a greater size than the ends of the projections**

v. Wherein the ends can be flared.

(8) **See Figures 7-9**

vi. Flared ends can be shaped

(9) **For claim 10 – see figure 7 (a) showing flared end (16) which is flat**

(10) **For claim 22 – see figure 7 (c) showing flared end (16) which is convex**

(11) **For claim 34 – see figure 7 (d or e) showing flared end (16) which is concave**

vii. Wherein the contact angle of the adhesion elements is greater than 70 degrees.

(12) **See paragraph 0016, 0066, and figures 4, 6, and 7-9**.

viii. Arzt teaches the formation of an adhesion element which has a decreased radius of curvature of the inner end (E1) and an increased radius of curvature (E2). **(See figure 7 part f)**. While Arzt does not expressly teach the mold used to make such an adhesion element, it is notoriously well known in the art that a mold used to form an article is concentionally just a negative of the article to be produced.

b. With respect to claims 10, 22, and 34, Arzt does not expressly teach wherein each of the mold cavities have a circumferential boundary wall extending in a lengthwise direction thereof continuously along a convex path, each convex path having a curvature with decreased radii of curvature adjacent an inner end and increased radii of curvature adjacent an outer end.

c. However, Tuma teaches when forming a fastening or adhesive structure a mold cavity is used which matches the dimensions of the element to be shaped

as the mold cavity. **(See figures 2 and 3 and column 4 line 30 to column 5 line 11)**. The shaping element in Tuma has circumferential boundary walls parallel from one another which are convex in nature. **(See part 13 of figure 2)**. These walls are curved to match the desired construction of the fastening/adhesive element.

ix. It would have been obvious to one having the ordinary skill in the art to use the mold technique of Tuma to create the adhesion elements of Arzt for the benefit of creating a large quantity of adhesion elements. As the use of shaping elements like the one of Tuma are well known in the adhesion element art, it would have been obvious for one having the ordinary skill in the art to use the mold of Tuma to make the structures of Arzt to form intricate parts in a uniform manner. In Arzt teaches the formation of an adhesion element which has a decreased radius of curvature of the inner end (E1) and an increased radius of curvature (E2). **(See figure 7 part f)**. While Arzt does not expressly teach the mold used to make such an adhesion element, it is notoriously well known in the art that a mold used to form an article is concentionally just a negative of the article to be produced. Examiner cited Tuma for this reference which makes the same hyperboloid structure claimed by appellant. **(See Tuma figures 2-3 and appelant figures 2-3)**. Examiner submits that Arzt and Tuma teaches the formation of many shapes of adhesion structures such as hyperboloids, concave, and convex configurations. It would have been

obvious to one having the ordianary skill in the art to seek the configuration which would provide the greatest adhesion force to mimick a gecko type fastener. Tuma teaches that hyperbeloid adhesion structures will provide an increased interlocking with complementary structures and Arzt teaches that adhesion structures can be modified to allow the structures to have additional interlocking strengths due to van der waal forces. It would have been obvious to one having the ordianry skill in the art that the the same improved properties would be seen from Arzt/Tuma's disclosure as the claimed mold and adhesion structure is nearly identical to that of Tuma's disclosure. Even assuming a minor difference, this would not rise to the level of a patentable difference for 103 purposes.

6. Regarding claims 16, 28, and 40, Arzt teaches the formation of various types of adhesion element shapes such as a concave/convex shape that must have been formed from a mold cavity having a similar shape to a hyperboloid. **(See figure 7)**.

d. Tuma also teaches using the same mold cavities to form hyperboloids.

(See column 3 line 36 and column 4 line 40)

7. Regarding claims 18, 30, and 42, Arzt teaches wherein the contact angle of the adhesion elements is greater than 70 degrees.

e. **(See paragraph 0016, 0066 and figures 4, 6, and 7-9)**.

8. Regarding claims 46-51, the Arzt does not teach wherein: (1) the curvature with the increased radii of curvature has a beginning closer to the inner end than the outer end and (2) wherein the beginning is at least 1/3 length portion of a curvature length.

f. However, Tuma teaches when forming a fastening or adhesive structure a mold cavity is used which matches the dimensions of the element to be shaped as the mold cavity. **(See figures 2 and 3 and column 4 line 30 to column 5 line 11)**. The shaping element in Tuma has circumferential boundary walls parallel from one another which are convex in nature. **(See part 13 of figure 2)**. These walls are curved to match the desired construction of the fastening/adhesive element.

x. The curvature and design of the mold cavity would be dependant on the element to be produced. It would have been obvious to one having the ordinary skill in the art to have a mold cavity which is the exact shape of the structure to be produced in order to form uniform parts.

9. Claims 20, 32, and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arzt et al. (WIPO Publication WO 03/099951 A2) in view of Tuma (Wipo Publication WO 2002/013647 A2) in view of Fearing et al. (US Pre-Grant Publication 2003/0208888).

10. Regarding claims 20, 32, and 44, Arzt teaches wherein the height is up to 200 micro meters. **(See paragraphs 0068-0070)**.

g. The combination of Arzt and Tuma does not explicitly teach: (1) wherein the adhesion elements have a diameter of 30 micrometers and a flared end of approximately 50 micrometers.

xi. Moreover, Fearing does teach wherein making adhesive microstructures, one having the ordinary skill in the art would seek to optimize: (1) the size of the microstructures; (2) the stiffness of the microstructures; (3) the adhesive force (Fo); and (4) the packing density of the microstructures. **(See paragraphs 0072-0077)**. Adjusting the size of the microstructures is done to adjust the adhesion strength and the packing density and would be optimized by one having the ordinary skill in the art.

xii. It would have been obvious to one having ordinary skill in the art at the time of invention to adjust the size of the adhesion element in order to optimize the adhesion strength of the microstructures, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch,* 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

11. Claims 14, 26, and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arzt et al. (WIPO Publication WO 03/099951 A2) in view of Tuma (Wipo Publication WO 2002/013647 A2) in further view of Full et al. (US Pre-Grant Publication 2005/0072509).

12. Regarding claims 14, 26, and 38, the combination of Arzt and Tuma does not expressly teach wherein the shaping element is a drum-shaped screen having at least 16,000 mold cavities per cm2.

h. However, Arzt and Tuma both disclose that imprinting can be used to form the shaped elements as a high rate of cavities per cm2.

xiii. **See Arzt at paragraph 0087**

xiv. **See Tuma at column 4 lines 12-29**.

xv. Full further teaches the use of an imprinting roller in order to achieve the desired mold cavities per cm2. **(See Figure 11A)**. Nanoimprinting is a well known process for achieving a high number of cavities onto a surface. As Fearing has envisaged such a nano-imprinting process a roller with mold cavities like the one disclosed in Full would be a conventional choice for one having the ordinary skill in the art.

xvi. This imprinting roller is the drum shaped screen having the requisite mold cavities per cm2.

13. Claims 21, 33, and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arzt et al. (WIPO Publication WO 03/099951 A2) in view of Tuma (Wipo Publication WO 2002/013647 A2) in further view of George et al. (USP No. 7,018,496).

14. Regarding claims 21, 33, and 45, the combination of Arzt and Tuma does not teach wherein the plastic material is crosslinked with or after molding of the adhesion elements.

i. However, George teaches wherein thermosetting compositions can be mixed with thermoplastic compositions and crosslinked in order to achieve an adhesion element having a high ultimate strength and heat resistance. **(See column 13 lines 8-17)**.

j. Thus it would have been obvious to cross link the plastic composition in order to make the adhesion elements stiffer.

(10) Response to Argument

Appellant argues that the independent claims (10, 22, and 24) are patentably distinguishable over the cited patent documents by (1) the use of thixotropic polyvinyl siloxane to form adhesion elements, (2) the density of 16,000 elements per cm2 of adhesion elements formed, (3) the claimed dimension of the adhesion elements, and (4) the shape of the mold cavity used to form the adhesion elements.

With respect to the 1st argument that the cited art does not teach a thixotropic polyvinyl siloxane. Examiner's position is that polyvinyl siloxane is known to be a thixotropic material. Examiner submits that the Arzt reference clearly teaches that the adhesion elements can be made of polyvinyl siloxane. (See paragraph 0103 of Arzt). In the final rejection (dated 09/28/2010 see response to arguments section) examiner cited evidence (Jenkins and Hahn) showing that polyvinyl siloxane is known to have thixotropic properties. As Appellant has provided no evidence countering this point, it is

submitted that polyvinyl Siloxane is inherently thixotropic or known to be thixotropic. As an additional point, examiner would like to point out that appellant has only stated the use of a plastic material which may be an elastomer such as polyvinyl siloxane or thixotropic. **(See appellant's specification dated February 11, 2009 page 9 lines 10-20)**. Appellant also seems to take contradictory positions in claiming a thixotropic polyvinyl siloxane by just disclosing polyvinyl siloxane in the initial disclosure while arguing that Arzt's disclosure of polyvinyl siloxane would not have a thixotropic property. (Appelant's argument).

With respect to the 2nd argument that the cited art does not teach an adhesion element density of 16,000 elements per cm2. Examiner submits that Arzt (paragraph 0069) teaches that the number of ahesion structures can be between 10^6 to 10^7 per cm2. The packing denisty is the number of adhesion elements (contact structures) per unit area and it would have been obvious to those having the ordinary skill in the art this packing density and applicant's number of adhesion elements would encompass the same scope.

With respect to the 3rd and 4th argument that the shape produced by the mold cavities would lead to an inventive adhesion structure with improved adhesion capabilities.

First Arzt teaches wherein the height of the adhesion elements is between 2-200 microns. **(See figure 6 and paragraph 0068 disclosing that the height (a) is 2000**

nm (2 microns) to 200 microns). Arzt goes on to teach a diameter of 20 nm (.02 microns) to 10 microns. **(See figure 6 and paragraph 0068 disclosing that the diameter (b) is .02-10 microns)**. Arzt then teach that the diameter of the flared ends are bigger than that of the diameter. **(See figures specifically figure 7 section f showing a flared end with an increased thickness when compared to that of the diameter of teh contact structures. In paragraph 0070 Arzt discloses that these projections (flares) can be up to 20 microns)**. Applicant has not specifically argued against the tecahings of Arzt with regards to the claimed dimensions nor disclosed any unexpected result or impoved property which is derived from the claimed dimensions of the contact structures.

In Arzt teaches the formation of an adhesion element which has a decreased radius of curvature of the inner end (E1) and an increased radius of curvature (E2). **(See figure 7 part f)**. While Arzt does not expressly teach the mold used to make such an adhesion element, it is notoriously well known in the art that a mold used to form an article is concentionally just a negative of the article to be produced. Examiner cited Tuma for this reference which makes the same hyperboloid structure claimed by appellant. **(See Tuma figures 2-3 and appelant figures 2-3)**. Examiner submits that Arzt and Tuma teaches the formation of many shapes of adhesion structures such as hyperboloids, concave, and convex configurations. It would have been obvious to one having the ordianary skill in the art to seek the configuration which would provide the greatest adhesion force to mimick a gecko type fastener. Tuma teaches that hyperbeloid

adhesion structures will provide an increased interlocking with complementary structures and Arzt teaches that adhesion structures can be modified to allow the structures to have additional interlocking strengths due to van der waal forces. It would have been obvious to one having the ordianry skill in the art that the the same improved properties would be seen from Arzt/Tuma's disclosure as the claimed mold and adhesion structure is nearly identical to that of Tuma's disclosure. Even assuming a minor difference, this would not rise to the level of a patentable difference for 103 purposes.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/AMJAD ABRAHAM/

Examiner, Art Unit 1744

Conferees:

/Yogendra N Gupta/

Supervisory Patent Examiner, Art Unit 1791

/Anthony McFarlane/